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JC511 U.S. PTO
09/599415
06/22/00

June 22, 2000

Atty. Docket No.: **11349-P65689US0**
CUSTOMER NUMBER: 00136

Assistant Commissioner of Patents
Washington, D.C. 20231

Sir:

Transmitted herewith for filing is the patent application of **YOUNG-JIN KIM** for **SEMICONDUCTOR FACTORY AUTOMATION SYSTEM AND METHOD FOR MONITORING AT LEAST ONE SERVER IN REAL TIME.** The application comprises a **13**-page specification including **11** claims (2 independent) and Abstract, **5** sheets of drawings, and a Declaration and Power of Attorney.

Accompanying this application for filing is:

Assignment document, cover sheet and $40.00 fee for recordation of Assignment;

A certified copy of **KOREAN** Application No. **1999-23538**, filed **June 22, 1999**, the priority of which is claimed under 35 U.S.C. §119; and

Information Disclosure Statement, PTO-1449 Form and copies of References.

The filing fee has been calculated as shown:

Large Entity		$ 690.00
Total Claims	11 in excess of 20 = 0(x $18.00) =	--.00
Total Ind. Claims	2 in excess of 03 = 0(x $78.00) =	--.00
	+	
	TOTAL FILING FEES	$ **690.00**

A check in the amount of **$730.00**, is enclosed to cover the Filing Fee. The Commissioner is hereby authorized to charge payment of any fees set forth in Sections 1.16 or 1.17 during the pendency of this application, or credit any overpayment, to deposit Account No. 06-1358. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

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Enclosures

SEMICONDUCTOR FACTORY AUTOMATION SYSTEM AND METHOD FOR MONITORING AT LEAST ONE SERVER IN REAL TIME

Field of the Invention

The present invention relates to a semiconductor factory automation (hereinafter, referred to as FA) system; and, more particularly, to a semiconductor FA system and method for monitoring at least one server in a real time.

Description of the Prior Art

Generally, a conventional semiconductor FA system automatically processes semiconductor wafers in order to produce semiconductor device, e.g., memory devices. The conventional semiconductor FA system includes process equipments (hereinafter, referred to as EQs), stockers and an automatic guide vehicle (hereinafter, referred to as AGV). An EQ applies a semiconductor process to the semiconductor wafers.

A stocker stocks a semiconductor wafer cassette containing the semiconductor wafers to be processed in the EQ. Further, the stocker also stocks the semiconductor wafer cassette, which has been already processed in the EQ.

The AGV transports the semiconductor wafer cassette to be processed from the EQ to another EQ or the stocker. Furthermore, the AGV transports the processed semiconductor wafer cassette from the EQ to the stocker.

In order to automatically control the above elements, e.g., the EQs, the stocker, the AGV and the like, the conventional semiconductor FA system also includes a number of control severs, e.g., an operator interface server (hereinafter, referred to as OIS), an EQ server (hereinafter, referred to as EQS) and the like.

The control servers employed in the conventional semiconductor FA system have been implemented by using, e.g., software programs contained in a large scale computer or distributed in a number of personal computers constituting of a client-server system.

In the client-sever system, a number of personal computers are coupled to a common communication line, e.g., Ethernet™ supplyed by Xerox Corporation. Each personal computer includes one or more software programs, each for a control server. In this case, if a personal computer is in an error state, the control servers contained in the personal computer may not perform its appropriate operation. Further, the productivity of semiconductor device may be seriously affected. Therefore, the semiconductor FA system having a client-server system strongly needs a scheme capable of monitoring operational state of the servers in a real time.

Summary of the Invention

It is, therefore, an object of the present invention to provide a semiconductor FA system and method for monitoring at least one server in a real time so that an operator can easily locate a failure of at least one server.

In accordance with an aspect of the present invention, there

is provided a semiconductor factory automation (FA) system, comprising: at least one processor for driving a program process and providing processor state information, wherein the processor state information includes an availability of a central processing unit, an availability of a disk and a state of the program process related to said processor; a storing means for storing the processor state information in a real time; a monitoring means for retrieving the processor state information in said storing means to monitor said processor; and a displaying means for displaying the processor state information retrieved.

In accordance with another aspect of the present invention, there is provided a method for monitoring at least one server in a semiconductor factory automation (FA) system, comprising the steps of: a) providing server state information from at least one server to a real-time database, wherein the server state information includes an availability of a central processing unit, an availability of a disk and a state of a program process related to the server; b) storing the processor state information in the real-time database; c) retrieving the server state information to monitor the server; and d) displaying the server state information retrieved.

Brief Description of the Drawings

The above and other objects and features of the instant invention will become apparent from the following description of preferred embodiments taken in conjunction with the accompanying drawings, in

which:

Fig. 1 is a block diagram describing a semiconductor FA system for monitoring at least one server in a real time in accordance with the present invention;

Fig. 2 is a block diagram illustrating a transportation control portion shown in Fig. 1;

Fig. 3 is an exemplary view showing a screen shown in Fig. 1;

Fig. 4 is an exemplary view depicting a relationship between servers shown in Figs. 1 and 2; and

Fig. 5 is a flowchart showing a method for monitoring at least one server in a real time in accordance with the present invention.

Detailed Description of the Invention

Referring to Fig. 1, there is shown a block diagram showing a semiconductor FA system for monitoring at least one server in accordance with the present invention. As shown, the semiconductor FA system includes at least one cell, which have a predetermined number, e.g., 4, of semiconductor production bays 400. A semiconductor production bay 400 is provided with EQs 204, stockers 216 and an AGV 214. The EQ 204 processes semiconductor wafers in order to obtain semiconductor devices. The EQ 204 includes, e.g., an etching equipment, a photo-lithography equipment, a furnace equipment, a physical vapor deposition (PVD) equipment, a sputtering equipment and the like. A stocker 216 temporarily stores a number of semiconductor wafer cassettes. Each of semiconductor wafer cassettes has a predetermined number of semiconductor wafers, which

is referred to as a lot. The semiconductor wafer cassettes are selectively transported to the EQ 204 by using the AGV 214. The semiconductor wafer cassette stored in the stocker 216 is transported to another semiconductor production bay 400.

A process equipment server (hereinafter, referred to as EQS) 202 is coupled to a common communication line 500, e.g., Ethernet™ supplied by Xerox Corporation. An AGV controller (hereinafter, referred to as AGVC) 212 controls the AGV 214.

The semiconductor FA system also includes a cell management portion 100, a real-time database 300 connected to the cell management portion 100, a temporary storage unit 310, a history management portion 312 connected to the temporary storage unit 310 and a history database 314 connected to the history management portion 312. The cell management portion 100, the history management portion 312 and the history database 314 are respectively connected to the common communication line 500 for communication therebetween.

The cell management portion 100 includes a cell management server (CMS) 206, an operator interface server (hereinafter, referred to as OIS) 201 and a data gathering server (DGS) 207. The DGS 207 stores process data associated with the lot in the real-time database 300.

The real-time database 300 stores information related to states of servers such as the CMS 206, the DGS 207, the OIS 201 and the EQS 202. A monitoring server 902 retrieves the information related to the states of servers in a real time. A screen 901 coupled to the monitoring server 902 displays the retrieved information related to the states of server in the real time. The state information related

to the servers includes an availability of a central processing unit (CPU), an availability of a disk, a state of a program process and a state of a connection port of transfer control protocol/internet protocol (hereinafter, referred to as TCP/IP). The state information further has a server identifier.

Referring to Fig. 2, there is shown a block diagram illustrating a transportation control portion shown in Fig. 1. As shown, the transportation control portion 116 includes intrabay control servers (hereinafter, referred to as ICSs) 210 coupled to the common communication line 500 and stocker control servers (hereinafter, referred to as SCSs) 218. The ICS 210 converts a transportation message into a transportation command from the common communication line 500. The SCS 218 generates a stocker control command to control the stockers 216 in response to the transportation command. The AGVC 212 generates an AGV control command to control an AGV 214 in response to the transportation command.

Referring to Fig. 3, there is shown an exemplary view showing a screen shown in Fig. 1. As shown, the screen 901 coupled to a monitoring server 902 shown in Fig. 1 displays states of servers such as the ICS 210, the SCS 218, the CMS 206, the OIS 201 and the DGS 207 shown in Figs. 1 and 2. Display spaces 807 display a state of a corresponding server, respectively. A display space 805 displays an availability of a CPU related to the corresponding server. A display space 806 displays an availability of a disk related to the corresponding server. When the disk, related to the corresponding server, has failed, a light emitting device 801 emits a light of a red color. Further, when the disk, related to the corresponding

server, has not failed, the light emitting device 801 emits a light of a green color.

When a program process related to the corresponding server is in a down state, a light emitting device 803 emits the light of the red color. Further, when the program process, related to the corresponding server, is not in the down state, the light emitting device 803 emits the light of the green color.

When a communication between the monitoring server 902 and the corresponding server is disconnected, a light emitting device 804 does not emit the light. Further, when the communication between the monitoring server 902 and the corresponding server is connected, a light emitting device 804 emits the light. A display space 808 displays a name of the program process of the down state.

Referring to Fig. 4, there is shown an exemplary view depicting a relationship between servers shown in Figs. 1 and 2. As shown, the monitoring server 902 has transfer control protocol/internet protocol (hereinafter, referred to as TCP/IP) 1000 to communicate with the EQS 202, the ICS 210 and the SCS 218. Similarly, the EQS 202, the ICS 210 and the SCS 218 have the TCP/IP 1000, respectively.

Further, the EQS 202, the ICS 210 and the SCS 218 include a state information monitor 1001, a CPU 1002 and a disk 1003, respectively. The state information monitor 1001 monitors an availability of the CPU 1002, an availability of the disk 1003, a program process and a connection port of the TCP/IP 1000. The state information monitor 1001 sends the availability of the CPU 1002, the availability of the disk 1003, a state of the program process and a state of the connection port of the TCP/IP 1000 to the monitoring server 902.

Referring to Fig. 5, there is shown a flowchart showing a method for monitoring at least one server in a real time in accordance with the present invention.

As shown, at step S402, the servers such as the CMS 206, the DGS 207, the OIS 201 and the EQS 202 send information related to states of the servers to the real-time database 300.

At step S404, the real-time database 300 stores the information related to the states of the servers.

At step S406, the monitoring server 902 retrieves the information related to the states of servers in a real time.

At step S408, the screen 901 displays the retrieved information related to the states of the servers in the real time. The state information related to the servers includes an availability of a CPU, an availability of a disk, a state of a connection port of TCP/IP and a state of a program process. The state information further a server identifier.

Although the preferred embodiments of the invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

What is claimed is:

1. A semiconductor factory automation (FA) system, comprising:

at least one processor for driving a program process and providing processor state information, wherein the processor state information includes an availability of a central processing unit, an availability of a disk and a state of the program process related to said processor;

a storing means for storing the processor state information in a real time;

a monitoring means for retrieving the processor state information in said storing means to monitor said processor; and

a displaying means for displaying the processor state information retrieved.

2. The semiconductor FA system as recited in claim 1, wherein said displaying means includes:

a first display space for displaying the availability of the central processing unit related to said processor; and

a second display space for displaying the availability of the disk related to said processor.

3. The semiconductor FA system as recited in claim 2, wherein said displaying means further includes:

a first light emitting device for emitting a light when the disk has failed;

a second light emitting device for emitting the light when the

program process is in a down state; and

a third light emitting device for emitting the light when a communication between said monitoring means and said processor is disconnected.

4. The semiconductor FA system as recited in claim 3, wherein said displaying means further includes:

a third display space for displaying identification information of the program process of the down state.

5. The semiconductor FA system as recited in claim 4, wherein said processor is coupled to Ethernet™ supplied by Xerox Corporation.

6. The semiconductor FA system as recited in claim 5, wherein said at least one processor includes a first processor and a second processor.

7. The semiconductor FA system as recited in claim 6, further comprising:

a semiconductor processing means coupled to said first processor for processing a semiconductor wafer cassette containing a predetermined number of semiconductor wafers;

a stocking means coupled to said second processor for stocking the semiconductor wafer cassette; and

a transportation means for transporting the semiconductor wafer cassette from said semiconductor processing means to said stocking means or from said stocking means to said semiconductor processing

means.

8. A method for monitoring at least one server in a semiconductor factory automation (FA) system, comprising the steps of:

a) providing server state information from at least one server to a real-time database, wherein the server state information includes an availability of a central processing unit, an availability of a disk and a state of a program process related to the server;

b) storing the server state information in the real-time database;

c) retrieving the server state information to monitor the server; and

d) displaying the server state information retrieved.

9. The method as recited in claim 8, wherein said step d) includes the steps of:

d1) displaying the availability of the central processing unit related to the server; and

d2) displaying the availability of the disk related to the server.

10. The method as recited in claim 9, wherein said step d) further includes the steps of:

d3) emitting a light when the disk has failed; and

d4) emitting the light when the program process is in a down state.

11. The method as recited in claim 10, wherein said step d) further includes the step of:

d5) displaying identification information of the program process of the down state.

Abstract of the Disclosure

A method for monitoring at least one server in a semiconductor factory automation (FA) system, includes the steps of: a) providing server state information from at least one server to a real-time database, wherein the server state information includes an availability of a central processing unit, an availability of a disk and a state of a program process related to the server; b) storing the processor state information in the real-time database; c) retrieving the server state information to monitor the server; and d) displaying the server state information retrieved. Therefore, the method monitors at least one server in a real time so that an operator can easily locate a failure of at least one server.

0022901 2006060

FIG. 1

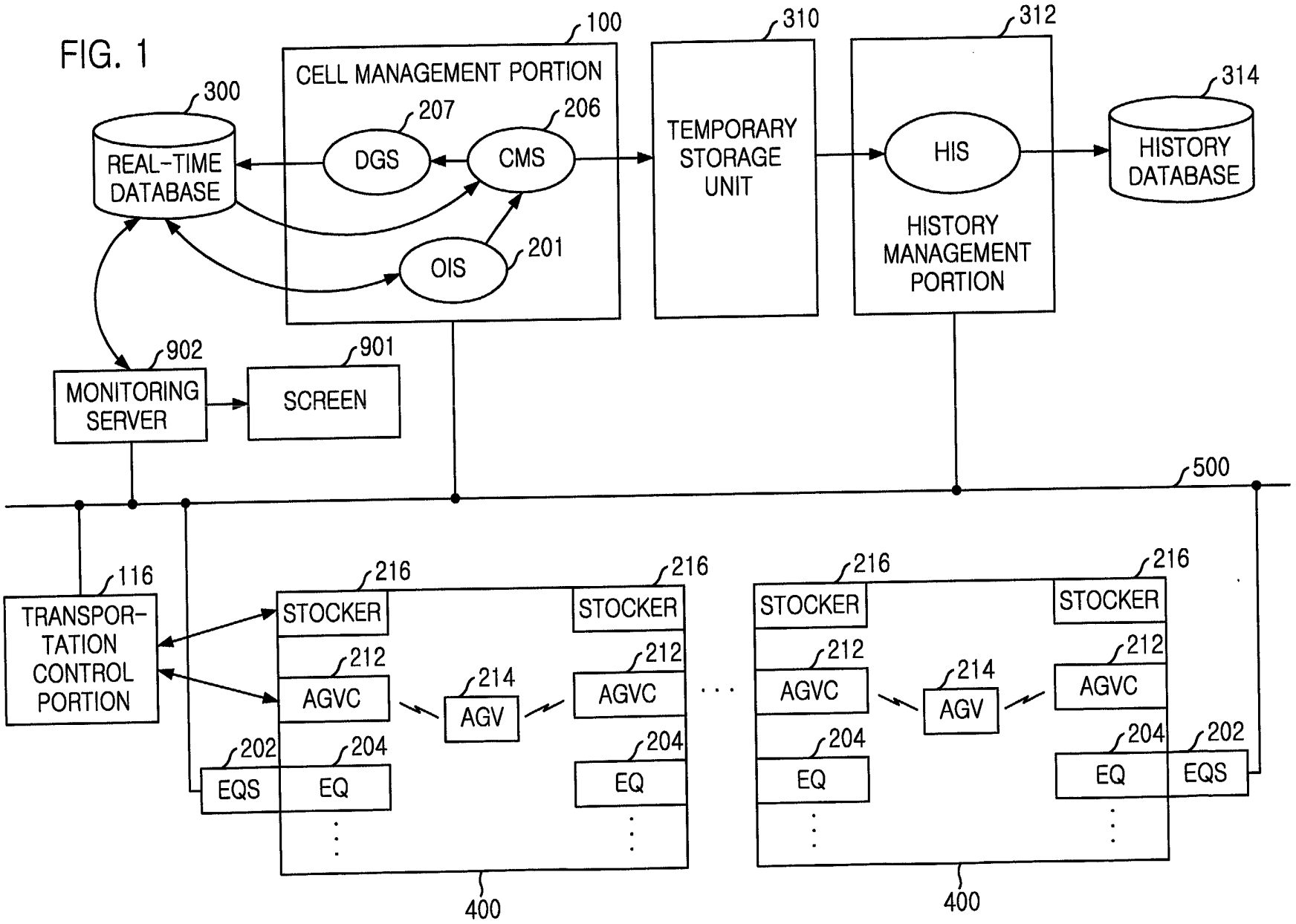


FIG. 2

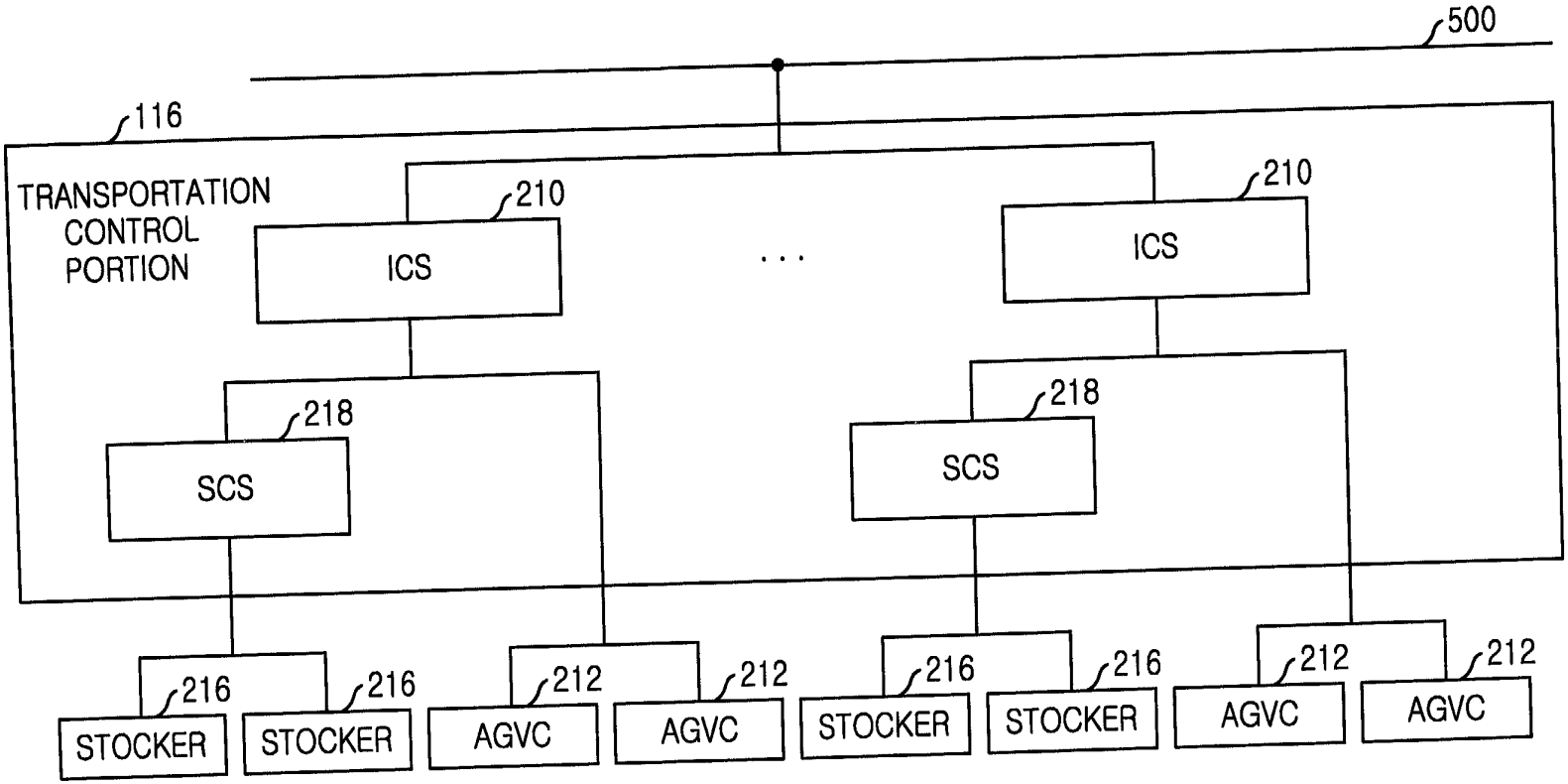
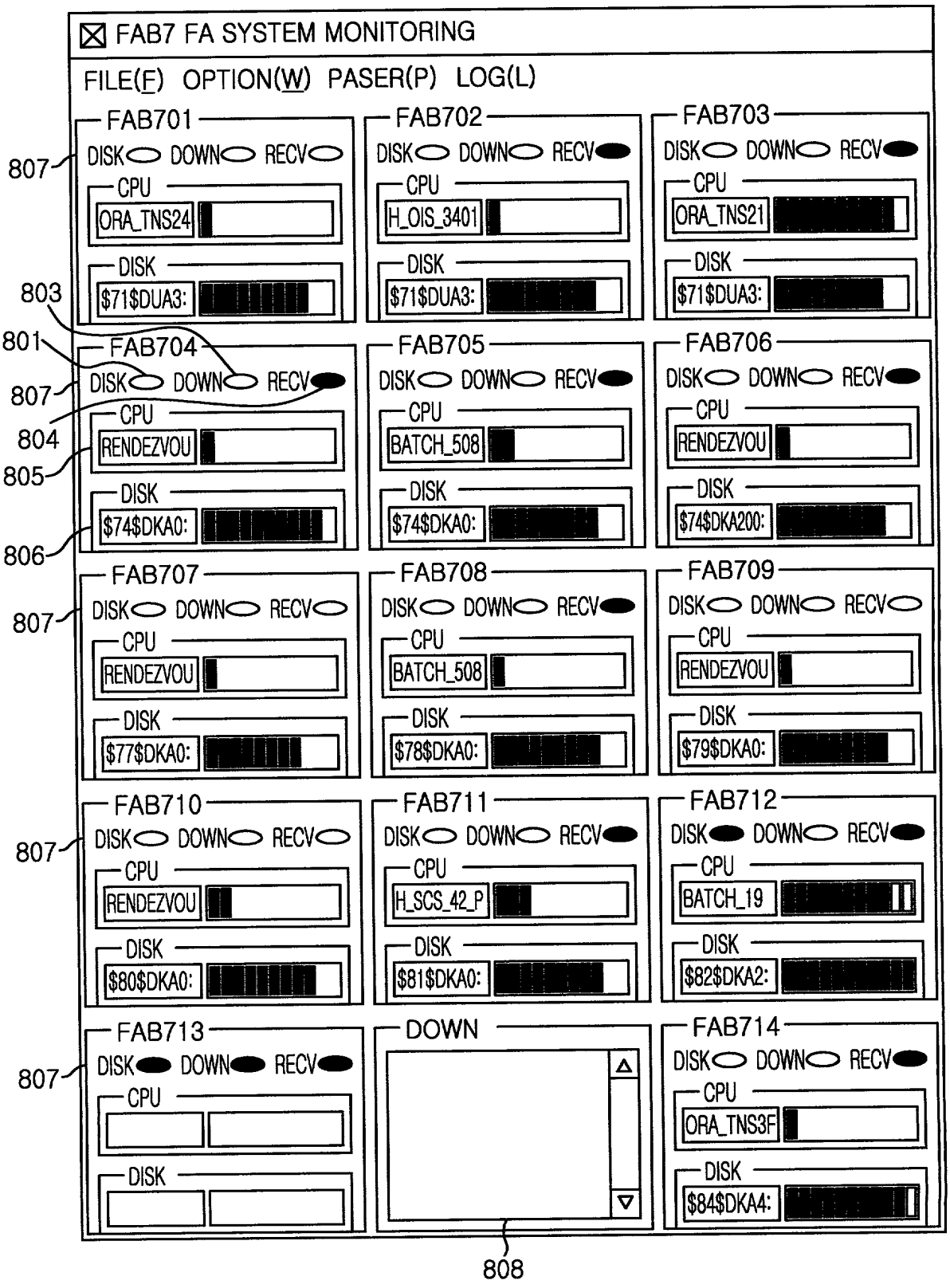

500
116
TRANSPORTATION CONTROL PORTION
210
ICS
...
210
ICS
218
SCS
218
SCS
216
STOCKER
216
STOCKER
212
AGVC
212
AGVC
216
STOCKER
216
STOCKER
212
AGVC
212
AGVC

FIG. 3


FAB7 FA SYSTEM MONITORING
FILE(F) OPTION(W) PASER(P) LOG(L)
FAB701
DISK DOWN RECV
CPU
ORA_TNS24
DISK
71DUA3:
FAB702
DISK DOWN RECV
CPU
H_OIS_3401
DISK
71DUA3:
FAB703
DISK DOWN RECV
CPU
ORA_TNS21
DISK
71DUA3:
FAB704
DISK DOWN RECV
CPU
RENDEZVOU
DISK
74DKA0:
FAB705
DISK DOWN RECV
CPU
BATCH_508
DISK
74DKA0:
FAB706
DISK DOWN RECV
CPU
RENDEZVOU
DISK
74DKA200:
FAB707
DISK DOWN RECV
CPU
RENDEZVOU
DISK
77DKA0:
FAB708
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DISK
78DKA0:
FAB709
DISK DOWN RECV
CPU
RENDEZVOU
DISK
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DISK DOWN RECV
CPU
RENDEZVOU
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FAB711
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CPU
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DISK
81DKA0:
FAB712
DISK DOWN RECV
CPU
BATCH_19
DISK
82DKA2:
FAB713
DISK DOWN RECV
CPU
DISK
DOWN
FAB714
DISK DOWN RECV
CPU
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DISK
84DKA4:
807
803
801
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805
806
808

0020900 5246560

FIG. 4

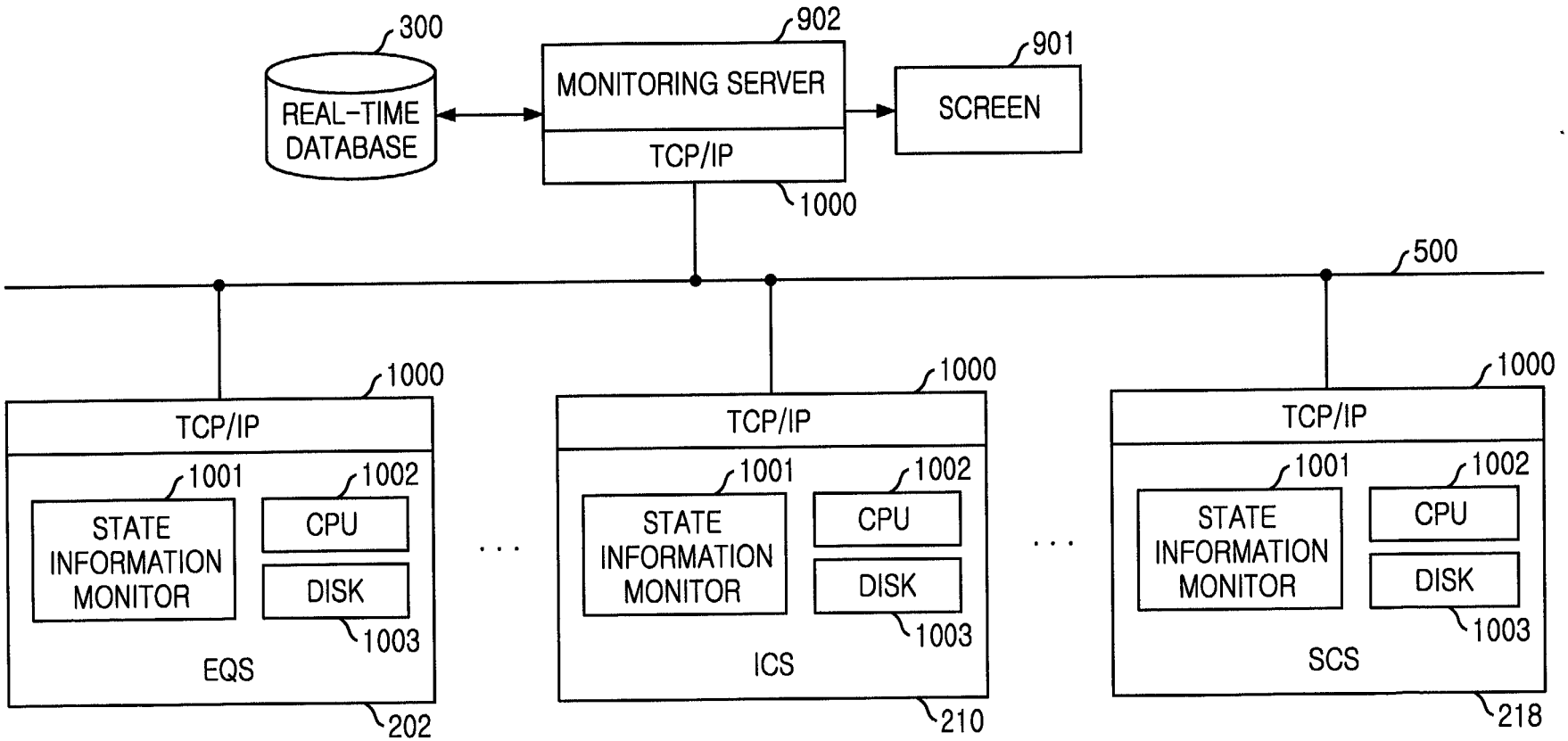
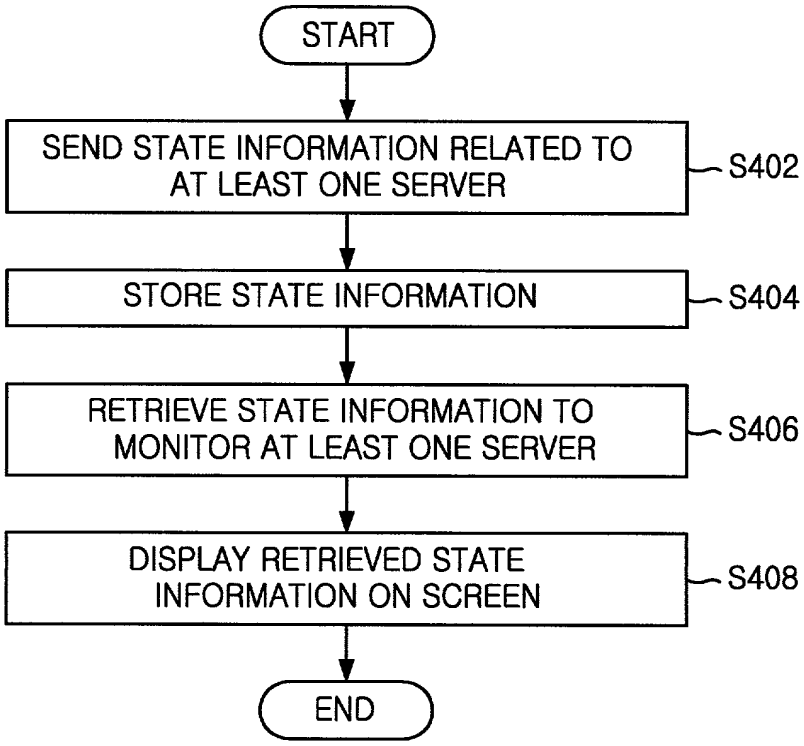


FIG. 5


START
SEND STATE INFORMATION RELATED TO AT LEAST ONE SERVER
S402
STORE STATE INFORMATION
S404
RETRIEVE STATE INFORMATION TO MONITOR AT LEAST ONE SERVER
S406
DISPLAY RETRIEVED STATE INFORMATION ON SCREEN
S408
END

DECLARATION AND POWER OF ATTORNEY U.S.A.

FOR ATTORNEY'S USE ONLY

ATTORNEYS' DOCKET NO. P65689US0

ALL PATENTS, INCLUDING DESIGN
FOR APPLICATION BASED ON PCT; PARIS CONVENTION; NON PRIORITY; OR PROVISIONAL APPLICATIONS

As a below named inventor, I declare that my residence, post office address and citizenship are stated below next to my name, the information given herein is true, that I believe that I am the original, first and sole inventor (if only one name is listed at 201 below), a first and joint inventor(if plural inventors are named below at 201-203, or on additional sheets attached hereto) of the subject matter which is claimed and for which patent is sought on the invention entitled:

SEMICONDUCTOR FACTORY AUTOMATION SYSTEM AND METHOD FOR MONITORING AT LEAST ONE SERVER IN REAL TIME

which is described and claimed in:

- ☐ PCT international Application No. _____ filed _____
- ■ the attached specification
- ☐ the specification in application Serial No. _____ filed _____ (if applicable) and amended on _____

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 (a)-(b) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s) (Number)	(Country)	(Day/Month/Year Filed)	Priority Claimed
1999-23538	Republic of Korea	22/06/1999	■ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No

I hereby claim the benefit under Title 35, United States Cod, § 119(e) of any United States provisional application(s) listed below:

Application No. _____ Filing Date _____ Application No. _____ Filing Date _____

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status: patented, pending, abandoned)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys(Registration No.) to prosecute this application, receive and act on instructions from my agent, and transact all business in the Patent and Trademark Office connected therewith. HARVEY B. JACOBSON, JR.(20,851); D. DOUGLAS PRICE (24,514); JOHN CLARKE HOLMAN (22,769), MARVIN R. STERN (20,640); MICHAEL R. SLOBASKY (26,421); JONATHAN L. SCHERER (29,851); IRWIN M. AISENBERG (19,007); WILLIAM E. PLAYER (31,409); and YOON S. HAM (45,307)

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	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE
203	FULL NAME* OF INVENTOR	FAMILY NAME	GIVEN NAME	MIDDLE NAME	
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP	
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under section 1001 of Title 18 of the United States Code; and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201*	SIGNATURE OF INVENTOR 202*	SIGNATURE OF INVENTOR 203*
Kim Youngjin		
DATE: June 14, 2000	DATE	DATE

☐ Additional inventors are named on separately numbered sheets attached hereto.

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